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DEVELOPMENT OF ENERGY MINERALS IN NORTHWEST COLORADO

May 1975

U. S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

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DEVELOPMENT OF ENERGY MINERALS in NORTHWEST COLORADO

TABLE OF CONTENTS

	Page No.
Overview	1
Energy-Minerals Resources	2
Coal	2
Planned Growth - Power Plants and Related Facilities	4
Railroads	4
Powerlines	4
Oil Shale	7
Federal Prototype Leasing Program	8
Private Development Plans	12
Oil and Gas	16
Bituminous Sands	17
Geothermal Steam - Statewide	17
Uranium	18
Other Minerals	19
Nahcolite and Dawsonite	19
Sand and Gravel	20
Other Resources	21
Wildlife	21
Wild Horses	21
Water	22
Archaeology and Historic Resources	23
Social-Economic	24
Recreation	27
Figure 1 - Locations of Energy Minerals in Northwest Colorado	Following 28

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BUREAU OF LAND MANAGEMENT

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DENVER, COLORADO 80202

May 1975

The northwest region of Colorado is presently experiencing a rapid industrial expansion due to energy minerals development. The greatest impetus stems from coal and oil shale. As the pace quickens, problems associated with rapid development in a sparsely populated area are becoming more obvious and more critical.

The situation is complicated by the fact that other mineral resources are being developed in the same area simultaneously. The most important minerals in the area other than coal and oil shale are: oil and gas, uranium, nahcolite and dawsonite (associated with oil shale), geothermal steam, and sand and gravel.

Other major associated projects that will proceed simultaneously with energy minerals development include product pipelines, power lines, water impoundments, diversions, pipelines and pumping plants, highways, railroads and by-product plants.

All of the above development activity is occurring in an area which contains the following significant nonmineral resources which will be impacted: people, communities and towns, wildlife, water, recreation, wild horses, archaeology and historic features, and livestock forage.

Approximately 38% of the seven-county northwest region of Colorado and nearly 80% of Piceance Creek Basin are national resource lands (NRL) managed by BLM. In addition, the minerals on about 20% of the private lands are owned by the federal government and managed by BLM. Because of this land ownership pattern, energy mineral developments and/or their associated off-site facilities will be located primarily on NRL. Similarly, urban expansion will involve NRL. BLM will be involved in nearly every development activity decision.

To achieve the goals of energy production, environmental protection (surface resource management) and orderly community growth will require a great many well coordinated and timely actions by federal, state and local agencies and industry. The mechanism necessary to accomplish coordinated and timely action are not well defined or generally recognized at this time.

The challenge is to assess the resource potentials, identify and weigh the gains and losses, and make decisions or recommendations that, in balance, best meet the needs of the American people.

Sincerely,

DALE R. ANDRUS
State Director

CONSERVE AMERICA'S ENERGY

Save Energy and You Serve America!

ENERGY MINERALS RESOURCES

The northwest region of Colorado is rich in energy-mineral resources. (See Figure 1). Development of any one or all of them represents a paradox of meanings. In relation to the national energy dilemma, development is heralded by some as a panacea. And in respect to industry, local governments, environmentalists, and to BLM, development represents a gargantuan problem in the area of planning, services and action vs. reaction.

Increased development of these minerals is already taking place. What impact this development will have upon the existing environment poses many questions. There is no single, simple answer. No one really knows the wide-ranging scope or complete timetable of development. The first step, however, must be in accepting the realization that any program of the magnitude promised cannot be looked upon as an isolated activity. All resources will feel the effects.

COAL

Present Situation

In 1974 there were 15 active coal mines in five northwestern Colorado counties (Moffat, Rio Blanco, Garfield, Routt and Pitkin) with total production of approximately 4.6 million tons.

About 75% of the coal production was from the four surface coal mines operating in the Mt. Harris - Oak Creek areas of Routt County. Essentially, all the surface mined coal was used for electric power generation. A small part was used commercially in sugar plants and for other minor uses. The balance of coal produced in these counties was from eleven underground mines. Underground mined coal is used for various purposes - electric power generation, commercial heating porcesses, and domestic heating.

Planned Growth - Mining (Strip operations)

Peabody Coal Company has submitted plans for the expansion of their existing strip operations on their existing lease. Planned annual production of 850,000 tons will be used to fuel the new Hayden II power plant owned by Colorado Ute Electric Association.

Energy Fuels Corporation has submitted two plans for expansion of their existing strip operations on their existing lease. New production will go primarily to Colorado Public Service Company's generating plants on the eastern slope.

W. R. Grace and Company has submitted plans for development of their properties south of Axial in Rio Blanco County. Anticipated production of three million tons per year will most likely be exported out of the state.

Utah International is currently doing exploration drilling on their existing lease. They will supply the coal for the two Colorado Ute power operations south of Craig. The first operation is planned for 1978 - the second in 1979. They estimate their coal needs to be 99 million tons for the 35-year life of the projects. This amounts to approximately 2.8 million tons per year.

Kemmerer Coal Company has completed exploratory drilling on their prospecting permit. They have filed for a preference right lease.

Consolidation Coal Company has commenced exploratory drilling on their existing lease.

Pittsburg Midway has submitted plans for the expansion of their existing strip operations on their existing lease.

Planned Growth - Mining (Underground operations)

Moon Lake Electric Association is currently conducting feasibility studies on large underground mine and mine-mouth generating plant near Rangely.

PLANNED GROWTH - POWER PLANTS and RELATED FACILITIES

Hayden II power plant (Colorado Ute Electric Association) is near completion and will have a rated capacity of 250 megawatts.

Craig #1 and #2 power plants (Colorado Ute Electric Association) are under construction and will have rated capacitites of 350 megawatts each.

Juniper Dam is in the final stages of planning. $60,000 has been authorized for engineering on this project.

Savory-Pot Hook Dam is in the pre-construction planning stage with pressure to speed development.

White River power plant (Moon Lake Electric Association) near Rangely is in the pre-construction planning stage. The engineering drilling has been completed. There is pressure for construction due to oil shale development.

RAILROADS

A line from Craig to Utah International's coal mining operations to the Craig steam plant operated by Colorado-Ute.

A line from Craig to Axial Basin to service W. R. Grace and Company.

POWERLINES

A line between Craig and Hayden.

Lines from Craig going both north and south. These will tie to existing and/or proposed power stations.

Moon Lake Electric line into Piceance Basin.

PREDICTED GROWTH - COAL

Rate of coal production from northwestern Colorado is expected to double within the next two years. By 1980, coal production should be about four times as great as the 1974 production.

Most of the immediate growth within the next two years will be concentrated in the presently active surface mining area between Mt. Harris and Oak Creek. It will consist of extending and expanding existing surface mines. Major growth beyond two years will spread westwardly along the Williams Fork Mountains in Routt and Moffat Counties and then southwardly to the Nine Mile Gap area in Rio Blanco County.

Coal production is expected from large new surface or underground or combination surface-underground mines in the Axial-Nine Mile Gap areas before 1980. Most of the early increased production from the Axial-Nine Mile will probably be shipped for out-of-area powerplant use. However, since this area contains huge reserves of good quality coal, it seems reasonable to expect plans before 1980 for power generation or perhaps even coal conversion in the Axial-Nine Mile area.

New coal production of up to 3/4 million tons per year is expected from new medium speed (production 500,000 tons per year (tpy) or less) underground mines in the Cameo Area, Mesa County, about 15 miles east of Grand Junction by 1980. One new mine at Cameo is being developed, but has produced no coal to date.

Some increase in the number and production of small underground mines (production 50,000 tpy or less) in Northwest Colorado is expected. No specific new proposed sites are known at this time.

The following table gives projected coal production for Northwest Colorado through 1990:

County	Million Tons Per Year 1975	1980	1985	1990
Routt	5.1	7.3	11.0	13.0
Mesa	0.2	0.7	1.0	1.4
Moffat	0.5	7.4	7.9	8.3
Rio Blanco	0.2	3.7	8.4	9.2
Total	6.0	19.1	28.3	31.9

Thick beds of lower grade coal north and west of Craig are not being developed at the present time. Plans to develop this coal are not known at this time; however, there may be considerable surface mineable reserves in the area, and it seems probable that great interest will develop prior to 1980.

In recognition of the many major Federal actions such as leasing, mine plan approvals and issuing rights-of-way, that are required for development of the coal resources of Northwest Colorado, BLM and USGS have commenced preparation of an Environmental Impact Statement that will address both site-specific impacts and the cumulative regional impacts of expected coal development. Current plans call for the completion of the first draft of this EIS by January, 1976.

The final draft of the coal programmatic EIS, that addresses the effects of Federal coal leasing nationwide, is presently being reviewed in the Department of the Interior. A portion of this statement is the Energy Minerals Activity Recommendation System (EMARS). EMARS is intended to generate rational Federal coal leasing in light of expected increases in energy demand, changes in the energy mix, and environmental considerations and constraints. Through the BLM planning system 20 tracts have been identified in Northwest Colorado for potential long term leasing.

OIL SHALE

The oil shale reserves of the Green River formation of Colorado, Utah and Wyoming, are estimated to be 1,842 billion barrels of oil in rock producing 15+ gallons per ton. Of this amount, the Piceance Creek Basin of Colorado contains estimated reserves of 1,200 billion barrels. These are "in place" reserves without consideration for losses during recovery. Though Colorado has the smallest geographic area of oil shale, it has the richest, thickest and best-defined deposits. It is predicted that oil shale development will be greatest in Colorado.

The existence of oil shale in the Piceance Creek Basin has been known since the-turn of the century. The process to extract oil from the shale, called retorting, has also been generally recognized since the mid-1800's. Actual production of shale oil first occurred in Scotland in 1850. In Colorado, some oil was retorted from oil shale mined in the southern part of Piceance Creek Basin near De Beque about 1910-1920. Shale oil has not been able to compete with conventional petroleum resources in a competitive market. It has always been cheaper to get oil from underground reservoirs in liquid form than to extract it from oil shale. On January 8, 1974, the first oil shale lease offering under the Department of the Interior's prototype oil shale leasing program was held. Tract C-a in Piceance Creek Basin, Colorado, brought a high bid of $210,305,600.00, and launched a new industry in Colorado in which BLM is going to be heavily involved. Since Tract C-a was leased in January 1974, five other tracts were offered. Two leases were sold in Colorado and two in the Uinta Basin of Utah. Two tracts in the Washakie Basin of Wyoming did not receive any bids.

In Colorado, the size of the emerging industry and the impacts on the region and on resources administered by BLM can't be gauged by the scale and design of the two federal lease developments alone. Four additional developments on private lands have been publicly announced in Colorado since the first lease sale. Each of these operations will be about the same size as the federal lease operations.

The following discussion summarizes oil shale activities in Colorado in terms of what is taking place in the Federal prototype leasing program and in the private sector.

FEDERAL PROTOTYPE LEASING PROGRAM

Tract C-a: This lease, containing 5,089 acres, was sold to Standard/ Gulf on January 8, 1974, for $210.3 million. Estimated recoverable oil shale reserves within the tract are 4.07 billion barrels of oil in minable beds containing 30 or more gallons per ton.

The preliminary development plan indicates a combination open-pit and underground mine and an off-site processing plant. Average pit depth will be 1,000 feet. Indicated production capacity is 100,000 to 300,000 barrels a day. Work force estimates range from 2,000 to 4,000.

A drilling program on the lease site will consist of 13 coreholes to provide definitive resource evaluations as well as subsurface geologic conditions, and 10 holes to obtain hydrologic data. Hydrologic data were collected in two categories: water quality and water production.

Surface water gauging and quality monitoring stations were established on major drainages around the tract by the U. S. Geological Survey under a program sponsored by the Colorado Water Conservation District, and supported by the lessee.

Other baseline data collection, such as air quality, and cataloging and physical characteristics identification of small mammals is also being conducted.

Plans are for a minimum 50,000 barrel-a-day plant with possible enlargement to 300,000 barrels a day over a period of time. Shale access is likely to be through a combination of open-pit and underground mining for surface retorting. The retorting method has not been determined yet.

Tract C-a is the only tract of the four leased that may be amenable to open-pit mining. The overburden is shallow enough and the deposits rich enough to justify consideration of open-pit mining on at least a major portion of the tract.

On-site employment over the next 2-3 years will not exceed 100 people. When construction begins, the work force could climb to 2,000 - 8,000 people. Permanent employment will probably be in the range 1,000 - 2,000.

Initial production of 10,000 barrels a day is expected to start in 1980, with full production obtained 2-3 years later. Processed shale disposal (up to 5,000 acres) and water storage (up to 4,730 acres) are planned off-site near the lease tract. This aspect has yet to be worked out.

Tract C-b: This lease was offered on February 12, 1974. The high bid was $117.8 million which was offered by a group consisting of Atlantic Richfield Company, The Oil Shale Corporation, Ashland Oil, Inc., and Shell Oil Company. An 18 hole core drilling program has begun, and the lessee has contracted for gathering of baseline environmental data including studies of surface water, ground water, flora and fauna, and soil surveys.

Estimated recoverable shale oil reserves within this tract are 3.5 billion barrels in minable beds containing 30 or more gallons per ton. Mining costs are expected to be higher than usual due to great amounts of ground water expected, and the relatively deep oil shale. Much of the ground water can probably be used in shale processing and spent shale compaction. The mining method proposed by the lessee is underground room-and-pillar and retorting will be on the furface. Production capacity is expected to be between 1,000 and 2,000. The plant facilities will be on-site, as will be nearly all of the spent shale disposal and reservoir sites.

The BLM and USGS are the principal agencies involved in administration of activities connected with the leases. We are assisted by other agencies such as EPA, HEW, HUD, State agencies and local governments. In addition, we receive advice on environmental matters connected with development activities from the Oil Shale Environmental Advisory Panel. This panel was established by the Secretary of the Interior and is comprised of State, Federal and private representatives. They are responsible for reviewing oil shale development plans and advising BLM, USGS, and the Secretary on environmental matters. The panel is chaired by William Rogers and is already heavily involved in reviewing exploration plans which have been submitted.

We are also receiving environmental data from the four oil shale environmental studies conducted in Colorado. The studies were funded jointly by Federal, State and industry, and were designed to obtain additional data in the following areas. These reports are completed:

Water Resources	U. S. Geological Survey
Revegetation and Rehabilitation	Colorado State University
Environmental Inventory & Impact	Thorne Ecological Institute
Regional Development and Land Use Planning	Oil Shale Regional Planning Commission thru THK Associates, Denver Research Institute and Bickert, Browne, Coddington and Associates, Inc.
Tax Lead Time Study for the oil shale regions, Mesa, Garfield and Rio Blanco Counties, Colorado	Governor's Committee on Oil Shale Environmental Problems (COSEP)
Tax Lead Time Study: Items for Legislative Consideration	COSEP Report (William Lamont, Jr.)

The Federal program lease terms require environmental studies to establish baseline data and detailed environmental monitoring programs. These numerous intensive study and design programs will require day-to-day interface between federal agencies, the public and industry to assure parallel planning and area-wide coordination and consideration of alternatives of greatest long-term value to nonmineral interests. In Colorado, the studies are already under way on the two lease sites. Both of the lessees have submitted exploration plans and the core drilling and water monitoring portions have been reviewed and approved.

Environmental groups take an active interest in oil shale development in Colorado. Many are well informed and very effective in their operations.

They have made important contributions to the prototype program, and will continue to monitor mineral operations. In effect, and correctly so, we and industry are operating in a "fishbowl". Mistakes in judgment will be easily seen and severely criticized. Development of an oil shale industry will depend largely on our ability to demonstrate to all segments of the public that this industry can serve the nation without undue degradation of the environment.

PRIVATE OIL SHALE DEVELOPMENT PLANS

Colony Development Operation has temporarily suspended plans to go into commercial production on patented lands near their "semi-works" plant on Parachute Creek near the southern edge of Piceance Creek Basin. An underground room-and-pillar mine and surface retort using the "TOSCO II Process" is planned.

Production capacity will be in the 50,000 to 150,000 barrel-a-day range. They expect to employ about 2,500 workers. On-site surface disposal of the processed shale is contemplated. Colony has announced plans to construct a company town that will accommodate 5,000 people near the existing town of Grand Valley. We are currently doing an EIS which includes consideration of their pipeline right-of-way, mine, commercial plant facilities, incoming power supplies, water requirements, the new town, and a land exchange. The draft EIS is expected to be published in August 1975.

Union Oil Company has announced plans to develop a commercial operation of about the same type and scale as Colony and in the same vicinity. The initial development will be a demonstration plant to process from 1,000 to 1,500 tons per day. This will be done to test Union's retorting process which differs somewhat from other processes tested and used by other companies.

Shale will be mined by the room-and-pillar method from their property near Grand Valley. Present plans do not call for company facilities to be built for housing of the workers.

Over $1 million is already being spent on environmental research. Ecology Consultants, Fort Collins; Bechtel, Inc., in San Francisco;

Stearns-Roger, Inc., Denver (air quality); Colorado International, Inc., Boulder (upper air management); Woodward-Thorfinnson, Denver (water studies); and Department of Agronomy, CSU, for revegetation studies, are some of the studies either in progress or completed.

Superior Oil Company plans to develop a combination oil shale-nahcolite-dawsonite operation on the northern edge of the basin as soon as they are able to consolidate their land holdings through an exchange they have proposed. The scale would be similar to Colony and Union, but employment would be less and all processed shale would be backfilled into the mine voids. They claim they can mine the shale without disturbing the large zone of saline water in the basin. They have a field office in Meeker near the development site and are actively engaged in predevelopment engineering, environmental studies, and negotiations on land exchanges, etc.

Occidental Oil Shale, Inc., is actively engaged in a pilot operation on a 4,300-acre tract in the Roan Creek drainage near the southern edge of the basin. Tentative plans are for a 30,000 - 75,000 barrel a day operation. They have stated publicly that they expect to go commercial on this tract if they are unsuccessful in acquiring a Federal lease. They have an unique in-situ process that involves limited underground mining, requires practically no water, and requires very little surface disposal of mine waste (no processed shale disposal).

Paraho Project: The U. S. Bureau of Mines has leased the Anvil Points Research Facility near Rifle, Colorado, to Development Engineering, Inc., project operator for the 17 participants in the joint venture, consisting of large and small oil companies, utility companies, engineering, mining and construction firms.

The project is scheduled for a 30-month duration, during which time the Paraho process (a process that has been used successfully in the past in calcining of limestone) will be completely tested for its applicability to extraction of oil from oil shale. The project currently employs 70 persons, with headquarters at Grand Junction.

A recent proposal calls for scale up to 6,000 - 8,000 bbl/day. This would be one retort, 100 feet tall and 40 feet in diameter. This is the size of individual retorts making up a battery of 12 - 14 to comprise a commercial facility producing 100,000 bbl/day. No firm decision has been made on this proposal, which requires additional government approval and private financing to become a reality.

Private Ownership: There are about 350,000 acres of land in the Piceance Creek Basin owned by various oil companies and individuals, the owners of which may enter the development picture in the near future. We have been contacted by nine of these companies regarding land exchanges. Their objective is to block up their holdings into economical, minable units.

In Summary the current oil shale picture is this:

1. Oil shale reserves on public and private lands in the Piceance Creek Basin will be developed by the emerging oil shale industry.

2. We are involved with much more than a prototype program due to recent interest by industry in developing private holdings.

3. Impacts and workloads will stem from operations on both Federal and private lands. BLM will be heavily involved since about 80% of the oil shale area is under its jurisdiction.

4. There is deep citizen and political concern regarding environmental and socio-economic impacts resulting from oil shale development.

5. Additional research needs to be done to fill data gaps identified through ongoing studies.

6. Industry is testing the feasibility of several types of extraction methods some of which may facilitate shale oil production at a faster rate than anticipated. In additon, some may cause less environmental degradation.

7. Development of the industry will depend largely on our effectiveness in working with environmental groups, advisory panels, state and local governments, other agencies and industry.

8. Oil shale development will generate many off-site activities and impacts. It cannot be developed independently. Orderly and timely development will depend greatly on meshing oil shale industry needs with those of other minerals and resources, including human resources.

OIL and GAS

Present Situation

There are 675 producing oil and/or gas wells in the area comprised of Routt, Moffat, Jackson, Rio Blanco and Garfield Counties.

These wells are producing 20 million barrels of oil and 26 million cubic feet of natural gas yearly. Approximately 63% of the oil and 84% of the natural gas is produced from Federally owned petroleum resources. The oil production amounts to approximately 50% of that produced in the entire State of Colorado. Active seismic operations for oil and gas are being carried on with 300 miles of new trails having been constructed during the past-year. There have been 150 drilling plans received during the past year.

Predicted Growth

The increasing number of notices of intent to conduct oil and gas exploration (seismic) and drilling plans received are clear indications of expanding interest in this area for oil and gas development. It is reasonable to expect a 10% increase in oil and gas activity per year in this area for at least the next few years.

It can be expected that projects similar to Rio Blanco for gas stimulation will be accelerated. Although there is no positive indication at the present time that such tests will result in increased production of natural gas, the impacts of the projects are present and will increase. If the tests are successful, the impacts will be even greater.

BITUMINOUS SANDS

Present Situation

Preliminary geologic investigations have delineated several areas of Northwest Colorado, which are potentially valuable for bituminous sands. Most of the deposits are along the Grand Hogback and the Danforth Hills, and are low grade.

There are no known valuable deposits, and there is no known present interest in developing the deposits.

Predicted Growth

As technology is developed and petroleum resources are depleted, development of bituminous sands will become a reality.

GEOTHERMAL STEAM - STATEWIDE

Present Situation

Colorado currently has roughly 276,000 acres under lease application. There are 958,080 acres in 27 "prospectively valuable areas" as designated by the U. S. Geological Survey.

Seventeen areas on the Western Slope have been designated as prospectively valuable for geothermal resources. These areas extend from the Steamboat Springs area south through Glenwood Springs to the great volcanic pile of the San Juan Mountains. However, only five of these areas contain a total of 23 lease applications. Three applications are in the Steamboat Springs area. Four are in the Waunita Hot Springs area east of Gunnison. Leasing applications have also been filed in the Ouray area, the Dunton-Rico area, and the Cebolla area--all on the margins of the San Juan Mountains.

Lease applications for 113 parcels have been filed east of the Divide. Here are the ten prospectively valuable areas, as well as the four "Known Geothermal Resource Areas" (KGRA), now designated on the basis of competitive leasing interest. There are 20,825 acres in the Valley View, Mineral Hot Springs, Poncha, and Alamosa County KGRA. Eight leasing units in these areas totalling 11,272 acres were offered for competitive sale on May 20, 1975.

The greatest geothermal potential in the state--center of the leasing interest and site of the four KGRAs--lies along the trace of the Rio Grande Rift zone in the south-central part of the state from Alamosa to Buena Vista.

Projected Growth

The focus of industry interest, as mentioned above, is in the San Luis and Upper Arkansas Valleys. Should valuable geothermal resources--for electrical generation or other applications--be discovered, interest in development may be expected to rise sharply on the basis of the nation's and area's thirst for inexpensive, low-pollution, alternate energy sources.

Superficially, the geothermal resource on the Western Slope appears to have less potential. However, it awaits exploration for a more accurate assessment of its prospects.

URANIUM

Present Situation

At the present time, we have 45 applications for prospecting permits to explore for uranium and associated minerals (gold, platinum, silver, etc.) on acquired lands in this area.

Projected Growth

Since uranium has been discovered in this area, although not developed, we can expect an increase in activity as the building and operation of nuclear plants increases. It is predicted that the building of such plants must increase to meet the energy needs.

OTHER MINERALS

NAHCOLITE AND DAWSONITE

Present Situation

Interior has issued four sodium leases and has an additional four lease applications pending, covering these minerals in the Piceance Creek Basin. The leases are within three miles of oil shale lease C-a and about 10 miles from oil shale lease C-b. The lessee is conducting economic, mining, processing and market studies and has definite plans for development of the leases at this time. No work is being done on the lease lands, but the lessee contacted this office recently regarding permits needed for exploratory and development work.

It has been reported that Superior Oil Company will produce nahcolite and dawsonite in their private land oil shale development.

Predicted Growth

As the use of coal increases, the development of the nahcolite can be expected to increase for its use as a stack scrubber in pollution control.

Since we currently import 90-95% of our aluminum, the development of dawsonite is expected to become critical. Indications are that foreign exporters are possibly thinking strongly about taking the same line as the foreign oil producers have recently taken. This would accelerate the development of dawsonite.

SAND and GRAVEL

Present Situation

High demands are being put on sand and gravel, especially in Rio Blanco County where sources are scattered, and in short supply. Several of the known sources are situated on national resource lands. Rio Blanco County has applied for a site on the White River where they propose to excavate 100,000 cubic yards of gravel. The town of Rangely has been granted a permit to excavate gravel immediately east of the townsite. Several other counties (Moffat, Grand and Jackson) have expressed interest in obtaining permits to excavate or establish pits on national resource lands.

Projected Growth

As the development of the previously discussed mineral resources increase, the demand for sand and gravel will increase in like proportion. Delineation of sites for obtaining this resource will become more critical.

OTHER RESOURCES

WILDLIFE

Present Situation

Over 300 species of wildlife inhabit the region, including mule deer, elk, sage grouse, bald and golden eagles, prairie falcons, 11 species of furbearers, 31 species of waterfowl and shore birds, 20 species of non-game mammals, 220 species of non-game birds and 21 species of fish. Threatened and endangered wildlife include: the peregrine falcon, black-footed ferret (possible), greater sandhill crane, Colorado River squawfish, humpback sucker and Colorado cutthroat. The Piceance Basin supports one of the largest migratory mule deer herds in North America (20,000+ animals) and serves as a wintering area for one of the largest concentrations of bald eagles in the western United States.

Game animals produce 213,000 hunter days for some 37,000 hunters. Mule deer alone provide a harvest of over 20,000 animals and 160,000 recreation days for 28,000 hunters from 28 states.

Predicted Impact

Major public concern is for the future of the mule deer herd. Elimination of winter habitat, as well as increased human activity, will adversely affect the herd and the economic base it now provides. Other wildlife in the region will be similarly affected.

WILD HORSES

Present Situation

Helicopter acounts made during the 1974-75 winter indicates there are 712 horses in the Northwest Region. Actual counts were adjusted for customary errors in helicopter census. Horses are disbursed as follows:

Douglas Mountain Area	355
Sand Wash	143
Piceance Basin	143
Douglas Creek	71

In addition the Grand Junction District reports some 85 horses in the Bookcliffs area.

It is estimated that the population of the herds is increasing 20 - 25% per year due mainly to the protective status provided by the Wild and Free Roaming Horse and Burro Act.

Predicted Impact

The law requires that the animals be protected. This may require that an area be set aside for their use and that some be removed as numbers increase beyond habitat capability. The increase in human activity in the area will adversely affect the free-roaming nature of the animals. It will also tend to concentrate the horses on only a portion of their normal range which will in effect support a smaller herd.

WATER

Present Situation

The region is noted for its clear streams which provide high quality water for various purposes, such as domestic use, power generation, agriculture, recreation, fish habitat and industry. The Colorado and White Rivers are the main drainages of the region and are of the greatest concern as regards development. At the present time there is an excess of water in relation to use but this will change drastically as mineral development accelerates. A recent Interior study indicated that there may not be enough water in the area to accommodate all of the development plans. Many people in the area have stated that they do not intend to allow existing industries, such as farming and ranching to be "dried up" by the energy minerals industry.

Predicted Impact

The long-term effect of industrialization in the region will cause a general decline in water quality with impacts focused on the White and Colorado Rivers. The degree of severity cannot be quantified at this time but will depend heavily on continuing research and monitoring. In addition, there will be increased competition for use of water. Industry will require large amounts of water to produce energy minerals, plus additional amounts for power generation, and revegetation efforts. As the population of the region expands, there will be increased demands for water for urban and municipal uses. Land uses will probably change as water rights are acquired and diverted from uses such as agriculture to energy minerals production. Additional reservoirs will probably be built to meet the water demands of the region.

Rio Blanco Oil Shale Project is negotiating for rights to 60,000 acre feet of water annually from the White River. The water would be taken out of the river 20 miles downstream from Meeker. The company states they are after industrial and not agricultural water.

ARCHAEOLOGY AND HISTORIC RESOURCES

Present Situation

Cultural resource values in the northwest region of Colorado are largely unknown since little work has been done on an area basis. Recent studies done in the Piceance Creek Basin indicate that the area has an extensive cultural resource but a great deal more needs to be done before its significance can be understood. To date, no significant archaeological, historic or scientific finds have been identified in the region, excluding of course, Dinosaur National Monument administered by the National Park Service.

The Fremont Indians are known to have inhabited the region but their nomadic nature, and disinclination to build impressive architectural structures make it more difficult to inventory and understand their culture, as compared to the Anasazi culture that inhabited the Mesa Verde area.

Predicted Impacts

Recent legislation (Public law 93-291, 88 Stat. 174, dated May 24, 1974) makes it mandatory to perform cultural examinations (archaeological, historical, paleontological) on "any Federal construction project or Federally licensed project, activity or program." Since little is known regarding the cultural resource values of this region, it is anticipated that some developments will be delayed in the future due to a significant find or until a more thorough inventory can be made. Some cultural resource values will probably be destroyed either through mining activity or due to increased human activity in the region.

SOCIAL-ECONOMIC

Present Situation

In the seven-county Northwestern region the 1970 population was 100,837, an increase of 15% over 1960. While the proportion of families with incomes under $5,000 was about the same as for the state (24.6% vs. 24.3% for Colorado) and the proportion of families under the poverty level was slightly lower than for the state (10.2% vs. 11.2% for Colorado), only 25.5% of the families within the region had incomes over $12,000 in comparison with 41.9% for all of Colorado. These regional averages are increased noticeably by a smaller number of higher income families residing in the resort areas.

Over the past 20 years the dependency of the area on agriculture as a source of employment and income has decreased substantially. Mining as a source of income and employment has decreased slightly and current projections of the mining sector indicate that mechanization will partially counter-balance increased production over the next year or two providing some additional jobs and modest increases in income.

Retail trade and other services presently account for a major portion of the income and employment in the region. Construction activities are based both on the building associated with the recreation-resort areas (condominiums, mountain homes and new stores, etc., in the principal resort communities) and the pivotal role that Grand Junction plays as the trade center for western Colorado and eastern Utah. Manufacturing in Grand Junction has increased somewhat over the past decade. The low rank of the wholesale trade sector is indicative of the fact that the region depends on Denver, Salt Lake and other major cities for primary, wholesale supply activities.

Some parts of the region have become retirement home areas for persons from outside the region as well as "havens" for those rural Coloradans removed from the recreation development areas either because of the associated higher living costs in the resort areas or their preference to live in quieter rural communities.

To summarize, the history of the region is heavily tied to the agricultural and mining activities of the past. Mechanization has reduced the dependence on these sectors while a new recreation-tourism industry has grown up and attracted regional and national attention. Immigration of new people, new interests and Grand Junction's growing role as a regional trade and travel center have dominated the recent past.

Predicted Impacts

Increased energy minerals development would first and easily change the currently declining agricultural and mining based economy to an energy-mining based economy. While the recreation-tourism industry would continue to exist, tourism would likely be adversely affected if the region lost its rural, scenic charm.

The estimated 1973 population was 118,146 for a 17% increase since 1970. Projected population for 1980 is 132,776 people or a 32% increase over 1970 (medium level projection; the "high" projection is 142,392 people for a 41% increase). Some of this increase can be attributed to energy minerals-development although these employment and population increases should be attributed primarily to construction of energy minerals related facilities (power plants and other processing facilities) rather than mining itself. Mining employment will increase in the future as the several plants and mines become operational.

Growth of existing or new communities will likely strengthen Grand Junction's role as a regional trade center, expanding the number and variety of services, facilities, products, etc. produced and offered.

The major impacts would be on the people and institutions now in the region. Construction of housing for construction and mine operation workers would be a first order of business. Existing local firms, building trades workers and inventories of building materials will be inadequate. Sources of financing for the building phase would also likely be inadequate and require support from outside institutions or from public funds. The base facilities in the several area communities will likely be inadequate to meet growing demands for sewer, water, schools, and other public facilities. Sources of funds for these public facilities must also be

developed, before the accompanying tax base grows adequately to provide for them.

The impacts on some local and regional firms ranging from materials suppliers to land speculators would no doubt be positive (in their view) yet costly to the new workers and their families. Considering the number of new people moving into the area it is doubtful that services or facilities would be adequate to meet needs at acceptable levels of quality. Some of the conditions might even be reminiscent of Gold Rush towns. Many people who had lived in the area providing a major cultural resource and source of continuity and stability to the region would likely leave as have many from the Aspens, Steamboats, Vails, etc.

In spite of the need for comprehensive planning by all counties in the region present evidence suggests a fragmented "can't wait" approach based on speculation rather than solid information.

In conclusion the magnitude of energy minerals development will spill into the very areas and towns now dominated by the recreation-tourism industry as well as the little agricultural and mining towns located along the Colorado, Gunnison, White and Yampa rivers.

RECREATION

Present Situation

The most significant recreational value in the region is winter sports and big game hunting, mostly for mule deer and elk. Other recreational opportunities include fishing, bird hunting, skiing, snowmobiling, river running, rock hounding, sightseeing and dude ranch activities. Archaeological ruins have recently been identified in Piceance Creek Basin but are not considered significant finds at this time.

Predicted Impacts

The quality and ultimate value of the areas rich complement of recreational opportunities will be adversely affected by increased mineral development, increased population, etc., unless a comprehensive minerals development and monitoring plan is established to mitigate damages. Water quality, availability of services, visitor-management and the areas visual integrity will be particularly important in retaining the recreational advantages of the area.

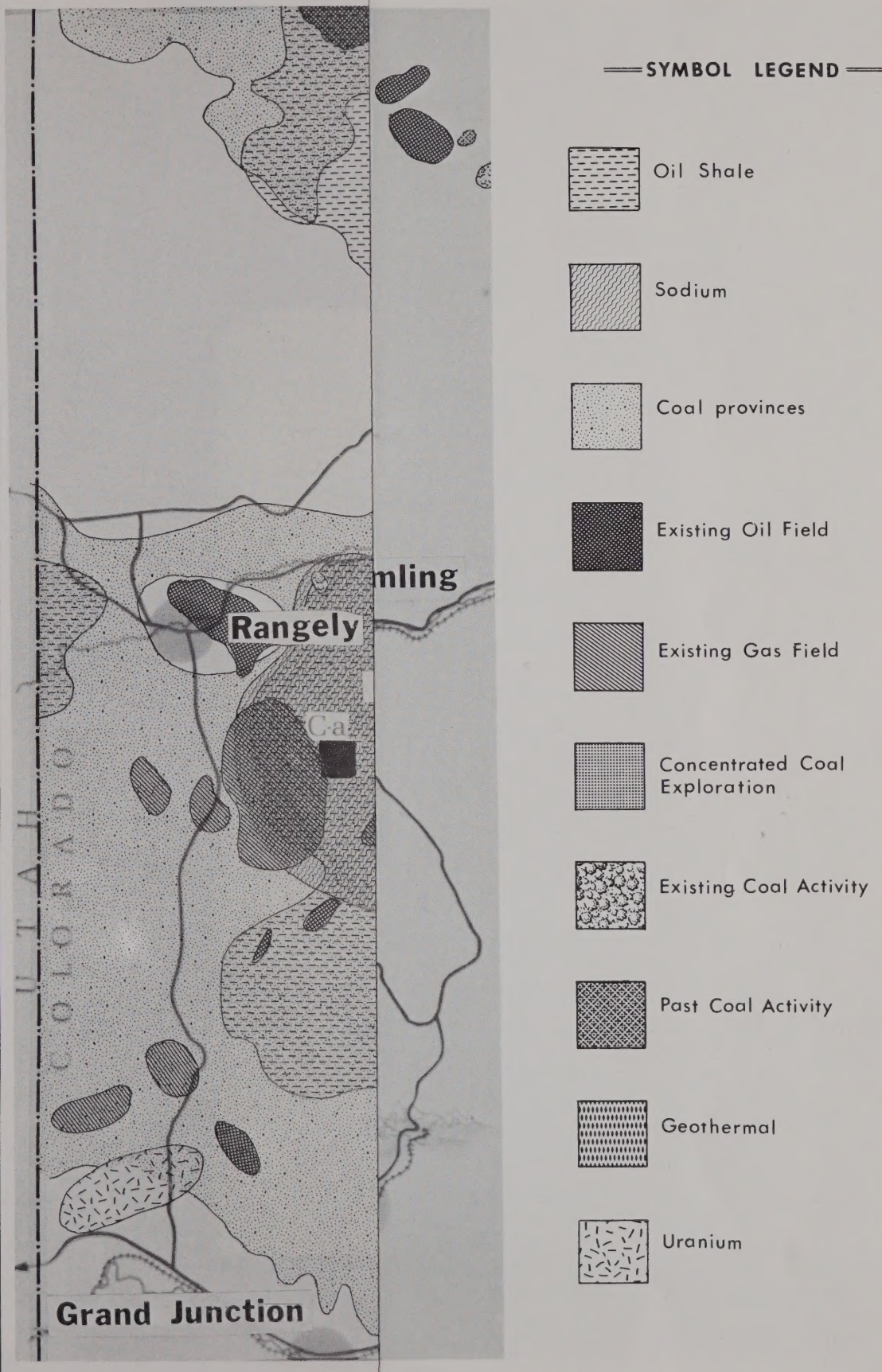

FIGURE 1—Locations of Energy Minerals in Northwest Colorado.

Minerals Data Reference Center

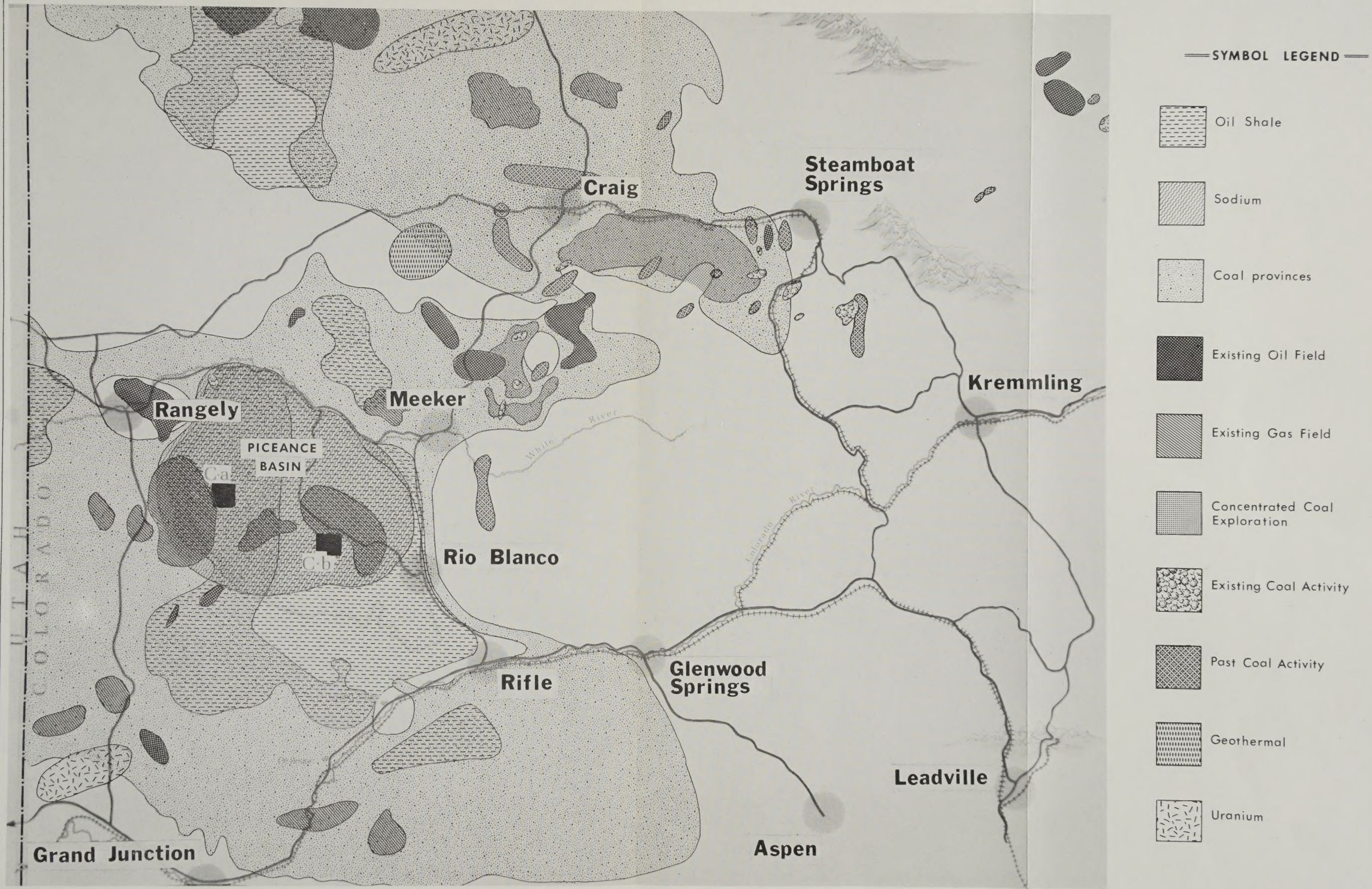

FIGURE 1—Locations of Energy Minerals in Northwest Colorado.

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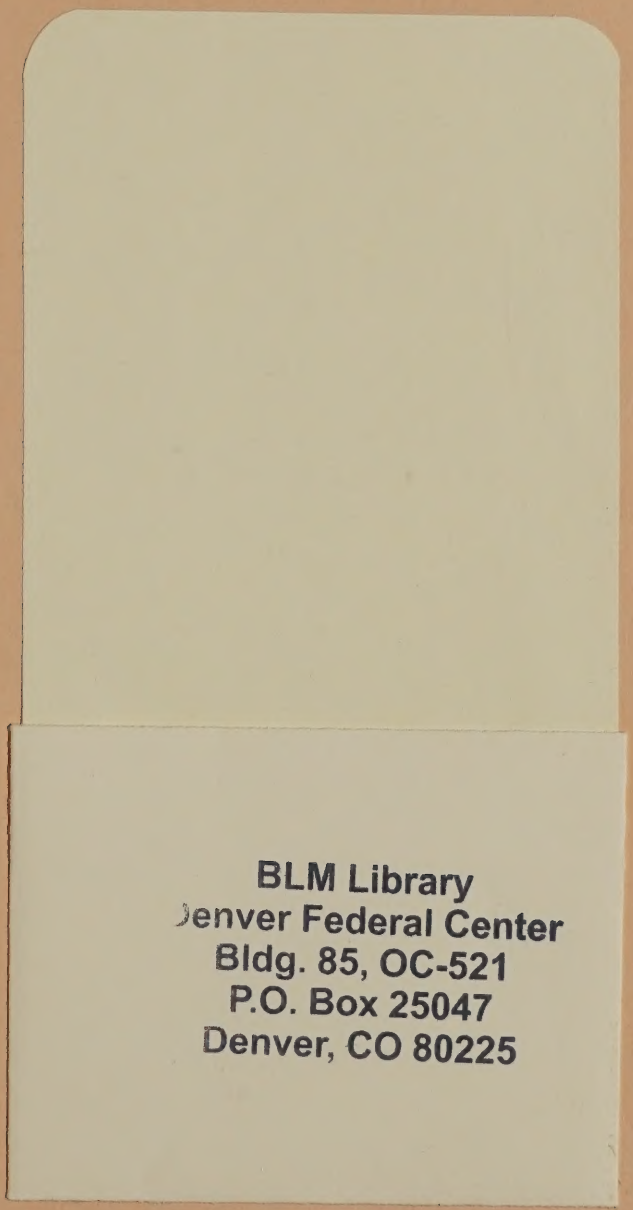

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